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# POWDER RIVER

## TRACT PROFILE
## COLSTRIP A & B TRACT, MONTANA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

#1528906237 ID: 88081467 HD 242.3 .P6937

SITE SPECIFIC ANALYSIS
5. COLSTRIP AREA A AND B

## INTRODUCTION

### A. PURPOSE AND NEED

The purpose of this analysis is to comply with the Secretary of Interior's decision that a sufficient number of tracts be delineated and selected for sale from the areas designated in land use plans as acceptable for further consideration for leasing to meet the regional leasing target. As a result of the 1979 Powder River Management Framework Plan (MFP) Update, federal coal in this tract was identified for further consideration for development through competitive leasing.

It should be noted that the acreage and legal description of federal coal discussed in this Stie Specific Analysis is limited to those areas thast have been included in the comprehensive land-use plan, in accordance with Section 3(A)(i) of the Federal Coal Leasing Amendments Act of 1976 and the decision of the U.S. Secretary of Interior June 2, 1979, that the coal to be selected for sale comes "from the areas designated in land-use plans as acceptable for further consideration" (page 60 of Volume I of the Secretarial Issue Document). The coal deposit tonnage listed from the Engineering Report of the U.S. Geological Survey includes areas outside of the BLM planning area.

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## I. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

### A. NO ACTION ALTERNATIVE

Under the no action alternative, additional federal coal would not be leased. Because of the "checkerboard" ownership patterns, development would not occur on the unleased portions of this tract. Approximately 146 million tons of federal, state and fee (private) coal, recoverable by existing methods, would not be mined. It should be noted that mining of fee coal and existing federal leases will continue to take place in the nearby area and within portions of the tract.

### B. PROPOSED ACTION

The proposed action is to offer for lease approximately 1,630 acres of federal coal within a 7,770-acre tract of land in Rosebud County, containing approximately 146 million tons of recoverable coal. The tract comprises an area identified as an economical mining unit for an addition to an existing 20-year strip mining operation. The tract currently consists of approximately:

1,200 acres of already mined area
2,100 acres of existing permitted mining area
720 acres of leased federal coal in non-permitted areas
1,630 acres of unleased federal coal
2,100 acres of fee (private) coal not permitted

The tract is located 2 to 3 miles southwest of Colstrip and 2 miles west of State Highway 314. See Map 1 for location and legal description.

The mining operation has an annual production of approximately 8.0 million tons and employs 240 persons. The tract is composed of 88.2 million tons of federal coal, leased and unleased, 55.0 million tons of fee (private) coal and 2.0 million tons of state coal. Surface disturbance is approximately 173 acres a year. Total disturbed area, both past and future, would be 3,460 acres from mining. Facilities are in place. A new haul road would disturb approximately an additional 120 acres.

The proposed action assumes that proper mining and reclamation will continue to be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (OSM) regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Department of the Interior's coal management program regulations (43 CFR 23 and 3400 and 30 CFR 211), and regulations of the Montana Department of State Lands.

For more specific information on the proposed mining operation, refer to the Engineering Report prepared by the U.S. Geological Survey.

Tract Delineation Report Summary

Tract Name: Colstrip A & B State: Montana

The Colstrip A & B tract is located in the center of the northern Powder River Basin, Rosebud County, Montana. The tract contains two recoverable coal beds, the Rosebud and McKay, which is present in multiple seams.

The coal deposit occurs in the top part of the Fort Union Formation (Paleocene), which comprises approximately 3,000 feet of sandstones, shales, siltstones, and coal seams. The formation occurs in nearly flat-lying beds. The coal is subbituminous in rank and weighs 1,770 tons per acre-foot. There are no known geologic hazards to surface mining in the Colstrip A & B tract. See the tract profile summary for the salient geologic data for the tract.

The generic mining plan calls for a surface mine using draglines, electric shovels, dump trucks, loaders, scrapers, and other support equipment. The coal would thus be mined to a depth of 200 feet or until the limiting stripping ratio (6:1) has been reached. The plan indicates that the coal would be shipped by railroad to an electrical utility out of the Powder River Region.

Tract Profile Summary

Colstrip A &B

| Coal Data | Proposed Action |
|---|---|
| Total Reserves (Million Tons Strippable) | 19 |
| Recoverable Reserves (Million Tons) | federal 17 (total 195) |
| Average Coal Thickness (Ft.) | 30 |
| Average Overburden (Ft.) | 80 |
| Coal Rank | subbituminous |
| Percent Recovery | 90 |
| Proximate Coal Analysis | |
| Percent Moisture | 23.1 |
| Percent Ash | 8.4 |
| Percent Sulfur | 1.0 |
| BTUs Per Pound | 8,920 |
| Mine Life (Years) | 20 |
| Annual Production Rate (Million Tons) | 6.6 |
| Tract Area (Acres) | 1,630 |
| Surface Mine/Truck Shovel Operation | |
| **Employment** | |
| Construction | No additional |
| Mine Operation | No additional |
| **Environmental Data** | |
| Water Requirements | 64 acre-feet/year. |
| Transportation, Land Use, VRM, Vegetation | Moderate during mining; low after mining. |
| Soils | High to moderate. |
| Reclamation | Low, if successful. |
| Wildlife | Moderate loss of habitat. |
| Noise, Air Quality | High during mining, low after successful reclamation. |
| Agriculture | Moderate during mining; low after successful reclamation. |

# TRACT PROFILE INTRODUCTION

## Background

In July 1979, the BLM, Miles City District Office completed the Powder River Resource Area update for portions of Powder River, Custer, Big Horn, Treasure and Rosebud counties. The land use planning process included applying unsuitability criteria, multiple-use conflict evaluation, and surface owner consultations. As a result of that work, areas were identified that could be further considered for coal development. The areas are available for consideration for new competitive leasing, leasing by exchanging and modifying existing leases.

Following land-use planning the BLM requested expression of interest which, along with other information, guided the GS in delineating this tract. Results of that work are summarized in this profile.

Personnel from BLM, Miles City District inventoried the tract to determine the site specific resource values and then analyzed potential environmental effects of coal development on this individual tract. Among other items, the unsuitability criteria (43 CFR 3461) were reconsidered on this site-specific basis. Any new findings of unsuitability are reflected in the delineation and development proposal of the tract described in this profile.

To be further considered for new competitive leasing, the tract will be presented to the Regional Coal Team who guides and reviews tract ranking and selection and sale scheduling procedures that develop alternatives which would be analyzed in a regional environmental impact statement (EIS). The EIS would analyze the site-specific and regional cumulative effects of coal leasing and development. Alternatives addressed in the EIS would include different combinations of tracts that meet a regional coal leasing target. The analysis of those groups of tracts would result in different impacts than the assessment made in this document for this specific tract. During the process this preliminary tract could be modified. Ultimately, the Secretary will select specific tracts for lease sale. If the tract is leased, the lessee would be required to submit a plan for mining and reclamation (M&R) to the Secretary of Interior, Office of Surface Mining (OSM) for review and approval within 3 years after leasing. Once a mining plan has been submitted, OSM would review the proposed developments of the mining plan. OSM would prepare a site-specific environmental assessment or EIS prior to approval of the mine plan.

Development of the tract is in accordance with the federal coal management program adopted by the Secretary, Department of the Interior, in June 1979. Basis of the program was, in part, the Final Environmental Statement for the Federal Coal Management Program. Implementation procedures are contained in Title 43 - Code of Federal Regulations - Part 3400 (43 CFR 3400). Authorizing actions are The Mineral Leasing Act of 1920, as amended; The Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; the Act of October 30, 1978, and Federal Regulations concerning federal coal leasing and development including 43 CFR 3400; 30 CFR 211; and 30 CFR 700-899.

In adopting the coal program, the Secretary established a tentative competitive coal leasing target of 776 million tons for 1982 in the Powder River Region of Wyoming and Montana. Subsequent sales would then follow on a 2 to 4 year cycle.

## Purpose and Need for Action

Purpose of the action is to offer strippable federal coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the nation.

This tract profile contains a summary of the tract delineation report and a site-specific analysis (SSA). The United States Department of the Interior, Geological Survey (GS) delineated the tract while the Bureau of Land Management (BLM) completed the site-specific environmental inventory and preliminary analysis.

Figure 1.2-1

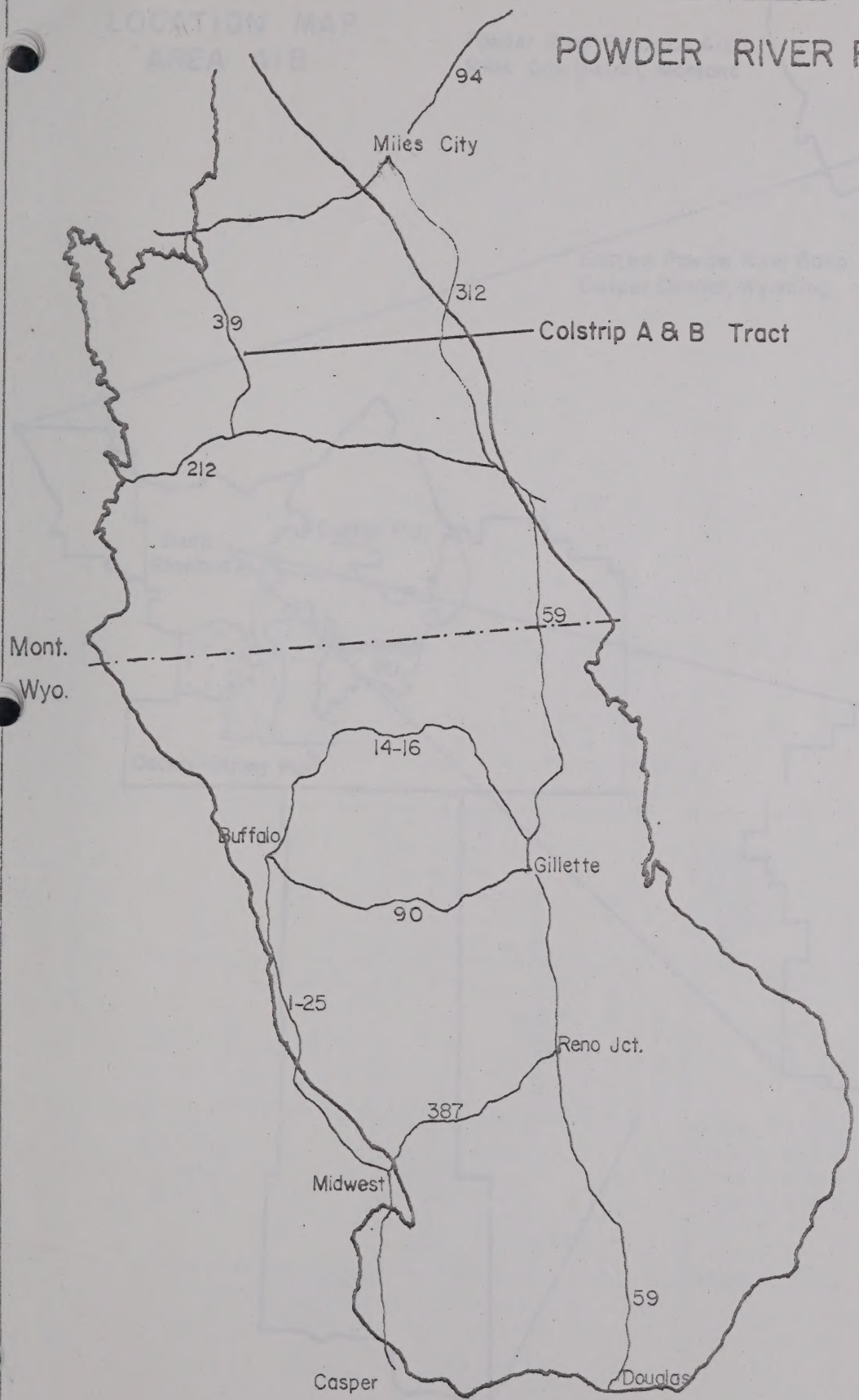
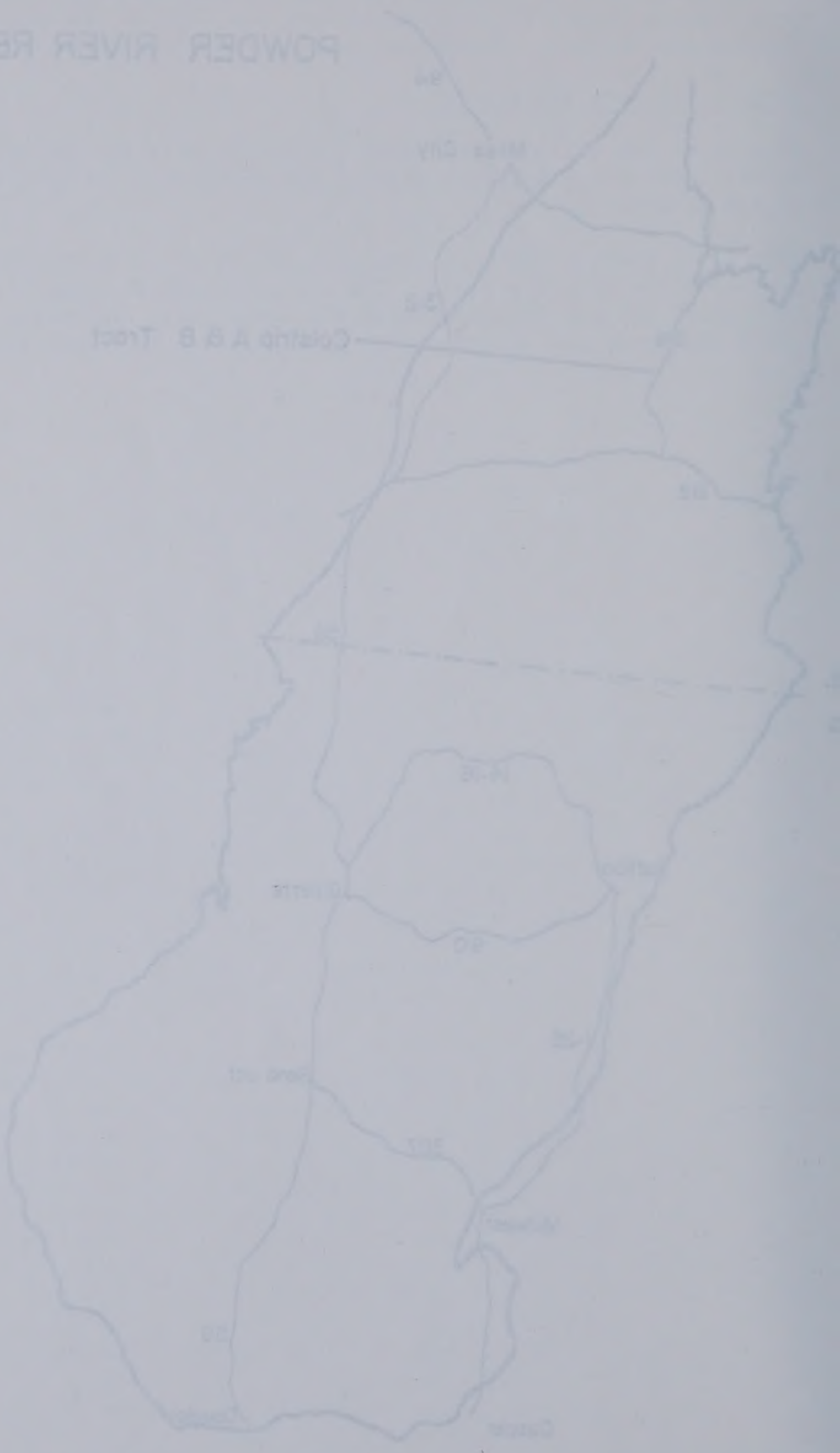
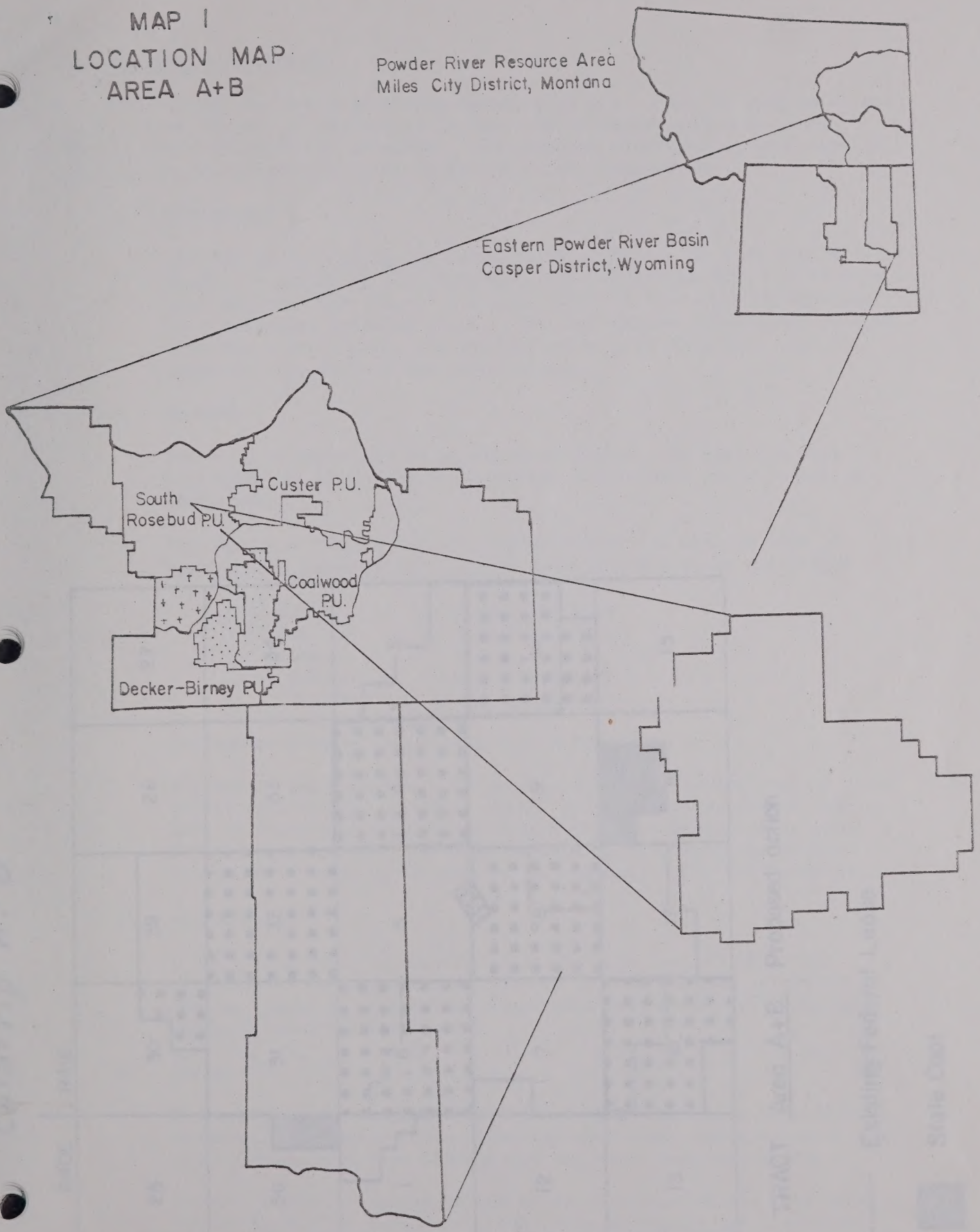



FIGURE 1.2-1



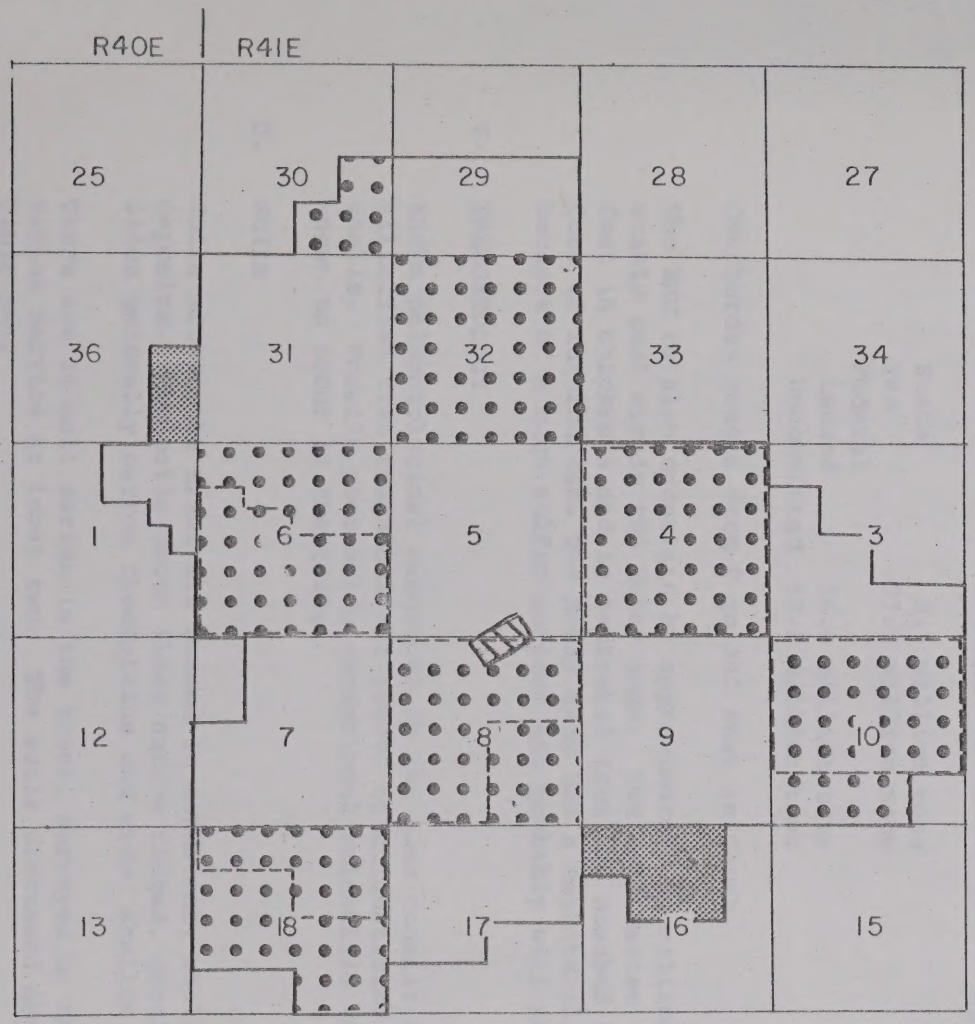
# MAP 1
# LOCATION MAP
# AREA A+B




Indian Land

National Forest

Colstrip A & B




TRACT Area A+B Proposed action

------ Existing Federal Lease

State Coal

Federal Coal

Mine Facilities

## II. AFFECTED ENVIRONMENT

The lands within the approved mining permit (See Map 1, second page) will not be discussed. No new or additional impacts beyond those described in the various EIS's are expected to occur. The elements discussed in this section are only for those outside of the existing permit boundaries.

### A. TOPOGRAPHY

The EMU is divided by the broad alluvial valley of East Fork Armells Creek. A series of low northeast trending ridges give relief to the area south of the creek. The area north of the creek is dominated by a northeast trending ridge. Erosion has cut steep-sided gullies into the ridge flanks. Elevations range from 3240 feet along the creek to 3670 feet on the ridge crests.

### B. GEOLOGY

The area is underlain by sandstones, shales, clinker, and coal belonging to the Tongue River Member of the Fort Union Formation (Paleocene).

The EMU is estimated to have approximately 146 million tons of recoverable reserves distributed among the following ownerships:

| | |
|---|---|
| State | 8.1 million tons |
| Fee | 77.9 million tons |
| Federal | |
| Leased | 56.9 million tons |
| Uncommitted | 52.0 million tons |

Overburden ranges from 0 to 300 feet in depth.

The EMU is also underlain by approximately 54 million tons of recoverable coal within the McKay seam. The seam varies from 5 feet to 9 feet in thickness and is separated from the Rosebud bed by about 60 feet of interburden. The McKay seam has a marketability problem because of a high sulfur content and probably will not be mined.

### C. PALEONTOLOGY

Known paleontological resources in the area consist of poorly silicified tree fragments and pieces of unidentified calcareous shells. Fossils possessing exceptional scientific value are not known to occur in the tract.

### D. SOILS

Soils within the tract are formed in sandstone, shale and alluvial deposits. The soils occur along narrow ridges, gently sloping hill sides generally narrow floodplains and wide, shallow valleys.

There are 36 soil series in the tract, surveyed by the Soil Conservation Service at level two. The soils discussed are listed in Table 5-1.

COLSTRIP A & B SOIL EROSION
TABLE 5-1

| Soil Mapping Unit Name | Depth 1/ Shallow 0-20" | Moderately Deep 20-36" | Deep 36+" | Percent Slope | Soil Erosion Potential 1/ Wind | Water | Surface Acres | Percent of Area | Soil Reconst. Potential 2/ | Soil Hazard Conditions | 3/ Suitability of Soil Material for Plant Growth (Acre Feet) Good | Fair | Poor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Armells-Kirby Clarrey loams; Burley-Kirby Clarrey loams, moist. | | | X | 15-70 | Low | High | 416 | 1 | Poor | Excess lime | 17 | 16 | 198 |
| Burley-Cabbart complex | X(.55) | | X(.45) | 25-70 | Low | High | 22 | <1 | Poor | Excess lime, stoniness | — | 24 | 80 |
| Burley-Cooeys-Kirby complex | | | X | 2-15 | Low | Mod. | 4 | <1 | Poor | Stoniness | 2 | 3 | 15 |
| Burley-Kirby-Cabbart complex | X(.30) | | X(.70) | 25-70 | Low | High | 273 | 6 | Poor | Stoniness | 16 | 229 | 1035 |
| Busby fine sandy loam | | | X | 2-8 | High | Low | 53 | 1 | Good | — | 208 | — | 57 |
| Busby fine sandy loam | | | X | 8-15 | High | Mod. | 139 | 3 | Good | — | 545 | — | 150 |
| Busby-Blackhall fine sandy loam | X(.30) | | X(.70) | 8-25 | High | High | 620 | 14 | Good | — | 1618 | 192 | 515 |
| Busby-Rock Outcrop complex | X(.35) | | X(.65) | 8-25 | High | Mod | 1 | <1 | Good | — | 2 | <1 | 1 |
| Cabbart-Yawdim Rock Outcrop complex | X | | | 15-70 | Low | High | 109 | 2 | Poor | Excess lime | 5 | 101 | 270 |
| Cambeth-Cabbart silt loams | X(.35) | | X(.65) | 4-15 | Low | High | 144 | 3 | Poor | Excess lime | 46 | 124 | 550 |
| Cambeth-Cabbart complex; Delpoint-Cabbart loams | X(.40) | | X(.60) | 4-25 | Low | High | 773 | 17 | Poor | Excess lime | 214 | 712 | 2795 |
| Camborthids-Torrifluvents association, channeled | | | X | 0-8 | Mod. | Mod. | 106 | 2 | Fair | Too clayey | 64 | 271 | 195 |
| Chinook fine sandy loam | | | X | 2-8 | High | Low | 126 | 3 | Good | — | 546 | — | 84 |
| Cooeys loam; Flaxville silt loam; Kremlin loam; | | | X | 2-8 | Mod. | Mod. | 308 | 7 | Poor | Excess lime | 160 | 265 | 1117 |

1/ Soil Depth, Erosion and Soil Erosion Potential is derived from the S.C.S. Soil Series Descriptions and Interpretations for Rosebud County.

2/ Soil Reconstruction Potential is derived from the National Soils Handbook.

3/ Depth (in acrefeet) of available soil calculated from acres x acrefeet/acre = suitability of soil material for plant growth.

| Soil Mapping Unit Name | Depth [1] Shallow 0-20" | Moderately Deep 20-36" | Deep 36+" | Percent Slope | Soil Erosion Potential [1] Wind | Water | Surface Acres | Percent of Area | Soil Reconst. Potential [2] | Soil Hazard Conditions | Suitability of Soil Material for Plant Growth (Acre Feet) [3] Good | Fair | Poor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loam silt loam | | | | | | | | | | | | | |
| Coors-Kinsey complex | | | X | 2-8 | Mod. | Mod. | 40 | 1 | Poor | Excess lime, stoniness | 21 | 39 | 138 |
| Delpoint-Cabbart loams | X (.45) | | X (.60) | 8-70 | Mod. | High | 592 | 13 | Poor | Excess lime | 203 | 740 | 1416 |
| Delpoint-Cabbart-Yamac loams | | | | | | | | | | | | | |
| Delpoint-Cabbart-Yamac complex | X (.55) | X (.45) | | 25-70 | Mod. | High | 56 | 1 | Poor | Excess lime | 4 | 63 | 155 |
| Kobar silty clay loam | | | X | 0-2 | Mod. | Low | 119 | 6 | Poor | Excess lime, too clayey | — | 258 | 337 |
| Kobar silty clay loam | | | X | 2-8 | Mod. | Mod. | 181 | 4 | Poor | Excess lime, too clayey | — | 393 | 512 |
| Kobar silty clay loam | | | X | 8-15 | Mod. | High | 60 | 1 | Poor | Excess lime, too clayey | — | 130 | 170 |
| Lonna silt loam | | | X | 8-15 | Mod. | High | 122 | 3 | Poor | Excess lime | 71 | — | 539 |
| Ustic Torriorthents | | | X | 15-35 | Mod. | High | 52 | 1 | — | * too variable to rate | — | — | — |
| Yamac loam | | | X | 2-8 | Low | Mod. | 84 | 2 | Poor | Excess lime | 77 | 105 | 238 |
| Yamac loam | | | X | 8-15 | Low | High | 7 | <1 | Poor | Excess lime | 6 | 9 | 20 |
| Yamac-Busby complex | | | X | 8-15 | Mod. | High | 72 | 2 | Poor | Excess lime, too sandy | 146 | 50 | 151 |
| Yamac-Cabbart loams | X (.45) | | X (.55) | 8-25 | Low | High | 149 | 3 | Poor | Excess lime | 69 | 176 | 422 |
| Yamac-Delpoint loams | | | X | 4-15 | Low | High | 202 | 4 | Poor | Excess lime | 125 | 242 | 463 |
| Yamac-Rentsac complex | X (.45) | | X (.55) | 2-15 | Low | Mod | 14 | <1 | Poor | Excess lime, stoniness | 8 | 12 | 31 |
| TOTALS | | | | | | | 4474 | 100 | | | 4173 | 4154 | 11654 |

**Soil Depths**
Shallow - 23%
Deep - 77%

**Soil Erosion Potential**
Wind
Low - 38%
Moderate - 41%
High - 21%

Water
Low - 10%
Moderate - 19%
High - 71%

**Soil Reconstruction Potential**
Good - 21%
Fair - 2%
Poor - 76%
*1% too variable to rate

**Suitability of Soil Material for Plant Growth**
Good - 19%
Fair - 18%
Poor - 52%
Unsuitable - 11%

## E. WATER RESOURCES

### 1. Ground Water

The Rosebud coal in the non-leased part of the tract is dry in 300 acres and is only partially saturated in other parts. Ground water flows at about 525 cubic feet per day (cu ft/day) toward East Fork Aremells Creek (Von Vorst et al 1977). Five stock wells are in use in the non-leased part of the tract. Medium total dissolved solids (TDS) concentration is 880 milligrams per liter (mg/L).

### 2. Surface Water

East Fork Armells Creek runs through the tract. However, all of the federal minerals adjacent to it have already been leased. It discharges an average of 2,200 acre feet (ac ft) annually near Colstrip, and flows except during extreme cold and during hot, dry summer periods. Only about 200 acres of the entire Armells Creek drainage is flood irrigated (USGS 1979). Total dissolved solids concentration (TDS), an index to salinity, varies from 178 to 4,110 mg/L ranging from 3,000 to 4,000 mg/L during low flow (Knapton and McKinley 1977). Mean TDS is about 2,900 mg/L.

Annual sediment yields are estimated at 0.5 ac ft/sq mi for non-mined land in the Colstrip area (USGS 1979b).

### 3. Alluvial Valley Floors and Floodplains

The East Fork Armells Creek floodplain and preliminarily defined alluvial valley floor (AVF) runs through the tract. However, all federal minerals under them have already been leased.

## F. VEGETATION

The Colstrip Area "A" and "B" Economical Mining Unit (EMU) consists of 7,770 acres. Of this, 4,474 acres will be treated as being disturbed by mining. Within this EMU 4,474 acres are made up of one major vegetative rangeland type (Payne 1973), which is the ponderosa pine savannah (See Regional paper, unpublished manuscript in Miles City District Office of BLM). The area included in the two vegetative types consists of: (a) grassland - 2,470 acres, (b) sagebrush-grassland - 620 acres, (c) ponderosa pine - 1,274 acres, (d) Other - 110 acres. Within these vegetative types, there are varying range sites with varying production yields (pounds per acre) and condition classifications. There are approximately 1,011 additional AUMs being produced per year on the 4,474 acre portion of the tract.

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G. LAND RESOURCES

1. Agriculture

Agriculture operations in this area are mainly livestock, hay (alfalfa or grass-legume) and some small grains. The bottomlands are flood-irrigated during spring runoff then sub-irrigated for the balance of the growing season. The water in Armells Creek is too high in salts and alkalinity for irrigation the rest of the growing season. Alfalfa, grass-legume hay or small grains (oats or barley) are crops raised to feed the livestock in the winter months. There is no land currently being used as cropland. In addition, there are approximately 1,772 acres of Class II, III and IV privately-owned land (39.6 percent of the tract) that are suitable for cropping, but not presently cropped.

Approximately 1,666 acres could produce approximately 1,968 tons of alfalfa and support 833 AUMs or produce 47,970 bushels of winter wheat per year and have 106 acres suitable for tame pasture, which could provide 81 AUMs.

The State of Montana owns about 38 acres of Class III and IV land (0.9 percent of the tract) that is suitable for cropland, but is not presently being cropped. This land could produce 32 tons of alfalfa and support 19 AUMs or produce 1,090 bushels of winter wheat.

2. Recreation

The tract is relatively isolated from recreational use or demand and there are no recreational developments in the area. Some hunting use occurs, but any other recreation activity is unlikely. Since no public access exists, use of the tract for recreation requires landowner permission. This restriction effectively prohibits use of the area, other than some possible trespass. The area contains no wilderness potential.

3. Other Land Uses

Land within the tract is presently used for ranching and an existing mine. Other use of the tract is for a portion occupied by a county road, which is also used for a haul road. Existing roads are gravel and receive low maintenance. Rail service currently exists to the operating mines to allow transport.

H. WILDLIFE

The Colstrip Area A and B tract is characterized as an open grassland with some areas of ponderosa pine savannah. Dominant shrubs found in the area are big sagebrush (Artemisia tridentata), silver sagebrush (Artemisia cana), and skunkbrush (Rhus trilobata). This vegetative mosaic provides habitat for a wide variety of wildlife.

One sharp-tailed grouse arena occurs in the EMU. No area was excluded by the unsuitability criteria because the arena is over private minerals. Attendance at this arena was 11 males in 1979 while average attendance at all arenas in a 160-square mile area was 13.1 males over a seven-year period. Relative density for the EMU is 0.13 arenas/sq mi.

Mule deer use of the area is light as the preferred rough breaks areas used for cover are not present in much of the tract. Summer densities of deer in the EMU are approximately 1.1 deer/sq mi. Up to 16 deer were observed during the severe winter of 1978-79.

Antelope use of the EMU is primarily during the summer months, with a small amount of spring and fall use. Up to 30 antelope have been observed during the summer. The Colstrip area is considered to be marginal antelope habitat due to the timbered nature of the area.

Pheasants are present in the EMU, but are found primarily in the East Fork of Armells Creek bottom and along the roadside ditches. The population is low compared to other areas and probably exists because the birds are fed during the winter by mine personnel.

The bald eagle has been observed as a migrant in the Colstrip vicinity and the golden eagle does nest in the Colstrip vicinity. One nest site has been identified 1.5 miles west of the EMU. Since this nest is located over private minerals, no exclusion was made for it. There are no other threatened or endangered species known to occur in the area.

State of Montana species of special interest or concern possibly found in the EMU are the Swainson's hawk, upland sandpiper, clay-colored sparrow, Brewer's sparrow, mountain bluebird, snapping turtle and plains hognose snake.

I. CULTURAL RESOURCES

Within the Colstrip A and B tract, 7,770 acres, including 100% of the surface over federal coal, have been inventoried at varying levels of intensity in ten surveys contracted by industry (D. Fredland 1972; Fredland and Fredland 1974; D. Fredland 1976; L. Fredland 1978, 1979, 1980a,b; McGinnis 1979; Munson 1980) and USGS (Lahren 1977). See map 2. The surveys have identified 14 prehistoric sites, including two bison kills, nine lithic scatters, one petroglyph site, one stone circle site, and one rockshelter; two historic homesteads; one recent rockshelter (i.e. occupied within the last fifty years); one occurrence of historic and modern petroglyphs (names and dates of 1891, 1941, 1943 and 1975), and 48 isolated finds. Seven sites, including one bison kill, five lithic scatters, one homestead, and 12 isolated finds are within areas already mined or under a current mine plan permit; compliance with Section 106 of P.L. 89-665, the National Historic Preservation Act

as amended, is complete or in the process of completion for these resources (Killam, personal communication December 17, 1980). For the areas under lease consideration in the tract, one bison kill has been determined eligible for the National Register of Historic Places; mitigation of the site through excavation is partially complete (Steere 1980).

Present impacts to cultural resources in the tract derive principally from erosion, rodent disturbance, mining activity and vandalism. Projected site density for the unsurveyed portion of the tract at 99% confidence is 2.88 $\pm$ 2.4 sites per 40 acres. There is a 10 percent probability of locating additional National Register eligible sites, based on present information.

J. VISUAL RESOURCE MANAGEMENT

The tract is located in an area presently being strip-mined and also used for ranching. Current intrusions are those activities associated with the active mines, with minimal effects from ranching operations. Because of the industrial nature, scenic quality is fairly low and dominated by the existing mines. This area principally consists of rolling terrain and is categorized as class C in scenic quality because of its common physiographic and vegetative characteristics.

K. ECONOMICS

Present employment in the affected areas of Colstrip and Forsyth in Rosebud County and Broadus in Powder River County is approximately 1883 energy workers. New workers, including both construction and operational employees at Western Energy Co., Peabody Coal and MONTCO mines, the increased railroad activity and Colstrip 3 and 4 power plants will increase 1983 energy-related employment as Rosebud grows by 2,152 workers. About 679 jobs in secondary sectors in Rosebud County would form during the same time period largely as a response to the new primary jobs.

By 1987 energy-related employment drops in Rosebud County by 2,027 workers due to the withdrawal of construction work forces from Colstrip 3 and 4 and the MONTCO mine partially offset by small gains in mining and power plant operating work forces. This decrease in primary employment would lead to a drop in total employment in Rosebud County of 1,360 jobs. (Some growth in secondary employment between 1983 and 1987 would occur due to long term changes in the composition of the economy.)

L. SOCIOLOGY

1. Population

Colstrip and Forsyth are undergoing another boom in population growth due to the construction of Colstrip 3 and 4 power units.

This rapid increase in population will strain the existing community. Once the construction period is over, the population and community will contract again, as it did when the construction of Colstrip 1 and 2 power units was completed.

2. Community Services

See foregoing discussion of population.

3. Attitudes

Overall, most residents in the Powder River area favor coal development (BLM 1980). This favorability, however, is not unconditioned; if it is felt that the nation does not need the coal to ease the national energy problems or that reclamation is not possible or not planned, favorability towards coal development would be greatly reduced.

Also associated with attitudes towards coal development are desires to see some controls on development. The controls are of two types: environmental and governmental. Environmental controls are centered around reclamation and concern for water supply and quality. The governmental controls are unspecified, but a strong feeling exists that some level or levels of government should exercise some controlling authority over development. Stated in another way, it is felt that mining companies should not have a free hand in the development of coal.

With respect to whether people were more concerned with environmental or social impacts, the responses were evenly split.

A breakdown of attitudes toward coal development by agricultural-nonagricultural respndents is not available at this time. However, it will be included in the EIS.

M. NOISE

Noises are of an artificial origin due to the use of heavy machinery and explosives in the area.

N. CLIMATE AND AIR QUALITY

The semiarid climate of the study area is characteristic of the continental steppes of the Northern Great Plains, in which the warmest months are the driest. The area has cool moist springs, warm dry summers, and cold moist winters. There are large periodic variations in annual and seasonal precipitation and temperature. The last 10 years have had generally optimum moisture and mild temperatures, but droughts can be expected to recur.

Precipitation in the area varies with elevation and with season. Mean annual precipitation is about 12 inches at low elevations, about 15 to 16 inches at high elevations. Mean annual precipitation at Colstrip is about 15 inches.

Mean annual temperature and seasonal patterns in temperatures are similar throughout the area. Mean annual temperature is about 45°F. Temperatures are lowest in January, averaging about 8°F, and highest in July, averaging about 90°F. High mid-summer temperatures terminate the effective growing season. Relative huimidity is lowest in July and highest in winter. The freeze-free season is about 115 days near Colstrip.

Upper winds are generally from the west. Mean seasonal wind speeds range from 12 to 23 mles per hour at 10,000 feet and 23-35 miles per hour at 18,000 feet. Fall and winter winds are fastest and tend to blow from the northwest; spring winds blow from the west and summer winds from the southwest. These patterns reflect the predominance of weather systems from the cold polar and Arctic regions in late fall and winter, the Pacific Ocean in the spring, and the Gulf of Mexico in the summer (Northern Great Plains Resources Program, 1974).

Surface wind annual mean speeds in the Colstrip area are about 11 miles per hour. Mean seasonal wind speeds appear to peak in the spring.

Data from the meteorological tower at Colstrip indicate that inversions are very frequent. Inversions occur every month of the year but are prolonged in the winter and broken up in the morning during spring and summer. Inversions are most likely to breakup between 8 a.m. and 3 p.m. at Colstrip. Inversion breakup would be most likely to bring high concentrations of pollutants to the ground in winter, when top heights of inversions are lowest. However, early morning (4-5 a.m.) inversions are more frequent in spring, and inversion breakups occur almost every morning around 8 a.m. Spring afternoon mixing heights vary considerably, suggesting the turbulence of the atmosphere during this season.

## CHAPTER III ENVIRONMENTAL CONSEQUENCES

This section describes the significant environmental effects that would occur with implementation of the proposed action including the alternatives. Such items as threatened and endangered plant and animal species, floodplains and wetlands, and wilderness values have been considered and are discussed as appropriate. Also, negative declarations included in the matrices are not presented within the impact discussion in this section. Principal basis for the analysis is the professional judgments of the resource specialists, public and other agency input, and related works, as referenced.

### I. NO ACTION ALTERNATIVE

The no action alternative would result in a "bypass" situation of federal coal resources underlying unleased areas, since mining is under- way and will progress on leased areas.

Under the no action alternative, 26.2 million tons of federal coal in Sections 30 and 32 (T2N-R41E) would be bypassed. In addition, 38.4 million tons of non-federal coal would be bypassed as mining the non-federal coal would require access through Section 32. Another 15.1 million tons of federal coal would not be produced from sections 8 and 18 (T1N-R41E), but no bypass of non-federal coal would result. Federal royalties foregone on 2.07 million tons of annual production would be $2,588,000. State severance taxes foregone on 3.99 million tons of annual production would be $8,767,000. The county and school district would not collect $1,085,000 of annual gross proceeds taxes due to the bypass.

Under the no action alternative, the paleontological resource would remain undisturbed. However, the potential for exposure and study of unearthed fossils would be lost.

If mining does not occur on the unleased area, the impacts related to this tract would be experienced only in areas to be mined.

## II. PROPOSED ACTION

### A. TOPOGRAPHY

The natural variety of landforms now displayed within the area would be reduced by mining. Slopes, out of necessity to abate erosion, would be reduced. Changing or altering the natural erosional patterns will increase the rates of the area's sediment yield until such time that natural vegetation can be reestablished.

### B. GEOLOGY

The major impact of the proposed action would be the removal of about 146 million tons of coal from the Rosebud seam. The McKay bed may be lost for future use if it is not mined along with the Rosebud seam.

### C. PALEONTOLOGY

Fossils may be destroyed during the mining process. However, surface disturbance may unearth fossils that could be collected and studies made of specimens that would have otherwise remained buried.

### D. SOILS AND RECLAIMABILITY

The proposed action would have a significant impact on the soil in the tract (See Table 5-1). By the end of mine life, 6,111 surface acres would be disturbed, in addition to 120 acres used for out-of-pit haul roads.

Soil impacts include: displacement of soil from wind and water erosion, change in soil structure and natural fertility, and significant problems in revegetation and stabilization on steep slopes.

In the tract, there is a moderate potential displacement of soil by wind erosion of 41 percent and a high potential displacement of soil by water erosion of 71 percent. (See Table 5-1.) Proper seeding of the stockpiles will reduce this.

Disturbances of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the soil. Salinity content would increase as a result of the lower calcareous horizons being brought to the surface.

The soil reconstruction potential is derived from the National Soils Handbook (USDA). The soil hazard conditions determine the reconstruction potential. The tract is rated as 21 percent good, two percent fair and 76 percent poor for reconstruction. Suitability of the soil material for plant growth is rated as 19 percent good, 18 percent fair, 52 percent poor and 11 percent unsuitable. (See Table

5-1.) The soils rated poor can be reclaimed, but would require more intensive and costly management to be revegetated and stabilized. Reclamation efforts made by Western Energy in the Colstrip area have been good, producing an excess of 1800 lb. of vegetation per acre, three years after reseeding. Costs of this reclamation exceeded $12,000 per acre, but thus far, has proved satisfactory. See discussion of short term versus long term impacts following.

E. WATER RESOURCES

1. Ground Water

About twelve wells would be affected outside the tract during mining of the non-leased part of the tract. Some of these wells are already impacted by mining in the vicinity. Flow into the pit during mining would be medium among Colstrip tracts at about 525 cu ft/day. Five wells would need to be redrilled to about the same depths, if needed after mining.

Following mining, water quality at the depth of the Rosebud coal seam and above in the vicinity of the mine would be degraded by increased salinity. The effect would be long term and significant. However, the water would still be useable for stock but would be even more marginal than the poor water currently used for household purposes.

2. Surface Water

Stream flow in East Fork Armells Creek would be slightly reduced during mining if adequate buffers and diversions are used. Following mining, slight effects on surface flow are possible. Sediment yields can be considered to be proportional to soil erosion losses discussed in the soils section. Low flow salinity would increase slightly after mining due to increased ground water saline concentrations. However, downstream flood irrigation and spawning would not be affected because of dilution by other water.

3. Alluvial Valley Floors and Floodplains

Area A and B is downstream from Area C so mining influence on the channel would be greater from A and B. All of the AVF and floodplain in the tract over federal minerals has been leased. Mining of the creek and alluvium could disrupt the flow during mining by diverting and detaining it. After mining, channel stabilization may be a problem. However, state and federal regulations require restoration of stream channels.

F. VEGETATION

If the range is in excellent condition (100-76%) there would be approximately an additional loss of 1,605 to 1,182 AUMs. However, in its present condition, there would be an additional loss of approximately 1,011 AUMs.

3-1/) The wells rated poor can be reclaimed, but would require more intensive and costly management to be revegetated and stabilized. Revegetation efforts made by Bureau Energy in the Colorado area have been good, producing an excess of 1000 lb. of vegetation per acre, three years after reseeding. Costs of this reclamation exceeded $1000 per acre, but have far, has proved satisfactory. See discussion of short term versus long term impacts following.

## 4. Water Resources

### 1. Ground Water

Seven twelve wells would be affected outside the tract during mining of the non-leased part of the tract. Some of these wells are already impacted by mining in the vicinity. Five into the pit during mining would be mainly along Colorado tracts at about 333 cu ft/day. Five wells would need to be redrilled to about the same depths, if needed after mining.

Following mining, water quality at the depth of the Roosevelt coal seam and above in the vicinity of the mine would be impacted by increased salinity. The effect would be long term and significant. However, the water would still be useable for stock but would be even more marginal than the poor water currently used for household purposes.

### 2. Surface Water

Stream flow in East Fork Arapaho Creek would be slightly reduced during mining if adequate buffers and diversions are used. Following mining, slight effects on surface flow are possible. Sediment yields can be considered to be proportional to soil erosion losses discussed in the soils section. Low flow salinity would increase slightly after mining due to increased ground water saline concentrations. However, downstream flood irrigation and spreading would not be affected because of dilution by other waters.

### 3. Alluvial Valley Floors and Floodplains

Item A and B is discussed from Area C as mining initiates on the channel would be greater from A and B. All of the AVF and floodplain in the tract over federal minerals has been leased. Mining of the creek and alluvium would disrupt the flow during mining by diverting and detaining it. After mining, channel stabilization may be a problem. However, stream and lateral readjustments require restoration of stream channels.

## 5. Vegetation

Of the range in moderate condition (180-760) there would be approximately an additional loss of 1,253 to 3,132 AUMs. However, in the present condition, there would be an additional loss of approximately 1,011 AUMs.

Reestablishment of native vegetative communities depend upon climatic conditions, species diversity and reclamation technique. Since this is an ongoing mining operation, the acreage being impacted is a part of the existing mine plan.

Mining of the area does temporarily eliminate opportunities for domestic livestock to occupy the surface and to utilize the forage. However, vegetative production may be better after mining (due to extensive reclamation work) and the area may produce more than the current number of AUMs per acre.

Additional impacts resulting from vegetation disturbances would be (a) possible reduction of the visual aesthetics, (b) increased soil erosion, and (c) reduction in the amount of wildlife and livestock forage.

The Office of Surface Mining assures that the mining company establishes a diverse, effective and permanent vegetative cover to standards set by the Montana Department of State Lands and the federal Bureau of Land Management.

G. LAND RESOURCES

1. Agriculture

The proposed action would have no significant impact on agriculture in the tract (see Table 5-2).

a. Economic Impacts On Agricultural/Sales Activity

(See the Regional Paper (unpublished manuscript, Miles City District Office of BLM)-"Agricultural Economics and Agricultural Impacts" for the classification of impacts). A loss of approximately $4,000 (all values in 1977 dollars) of ranch output and of about $1,000 of secondary income was estimated due to on-site disruption at peak disturbance.1/ No additional losses due to urbanization are expected as land at Colstrip would already have been irrevocably lost. Information on the degree to which ranchers would be compensated for these losses is not available. It is known, however, that many ranchers value their lifestyle so highly that no compensation would be seen as adequate (Bradley 1979, Bennett 1980).

1/ To correctly state income losses, ranch budget simulation analytical models and an inter-industry model would be needed. As these analytical tools were not available in time to do the site specific analyses, the values used are estimated from secondary data. Any bias in the analysis was uniform (consistent error) and should not affect inter-tract comparisons. Bureau of Land Management agricultural specialists are attempting to secure access to more sophisticated analytical tools for future analyses of agricultural impacts.

TABLE 5-2

Co. T.1D (Areas "A" & "B")

| Surface Ownership | Percent of Area | Acres | Land Capability Class 1/ Non-irrigated | Land Capability Class 1/ Irrigated | Use of land 2/ | Predicted Average Yields (Acres X Ave. Pred. Yld/Acre) = 2/ Wheat Dry land (Bu) | Wheat Irrigated (Bu) | Barley Dry land (Bu) | Barley Irrigated (Bu) | Oats Dry land (Bu) | Oats Irrigated (Bu) | Alfalfa Dry land (Ton) | Alfalfa Irrigated (Ton) | Tame Hay Dry land (Ton) | Tame Hay | Pasture Dry land (AUM) | Pasture Irrigated (AUM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Private | 15.11 | 676 | IIIe | — | Not Presently Cropped | 21778 | — | 30786 | — | — | — | 635.8 | — | 553.1 | — | 635.8 | — |
| Private | 2.66 | 119 | III | II | Not Presently Cropped | 4165 | 9520 | 5950 | 9520 | — | — | 107.1 | 714.0 | 107.1 | — | 107.1 | 952 |
| Private | 2.37 | 106 | III VII | — | Not Presently Cropped | 2507 | — | 3582 | — | — | — | 80.6 | | 62.7 | — | 80.6 | — |
| Private | 19.47 | 871 | IV | — | Not Presently Cropped | 22027 | — | 30480 | — | — | — | 617.8 | — | 506.5 | — | 617.8 | — |
| Total | 39.61 | 1772 | | | Not Presently Cropped | 50477 | 9520 | 70798 | 9520 | — | — | 1441.3 | 714.0 | 1229.4 | — | 1441.3 | 952 |
| State of Montana | 0.40 | 18 | IIIe | — | Not Presently Cropped | 576 | — | 810 | — | — | — | 18.0 | — | 18.0 | — | 18.0 | — |
| State of Montana | 0.45 | 20 | IIIe | — | Not Presently Cropped | 514 | — | 714 | — | — | — | 14.0 | — | 12.7 | — | 14.0 | — |
| Total | 0.85 | 38 | IIIe | — | Not Presently Cropped | 1090 | — | 1524 | — | — | — | 32.0 | — | 30.7 | — | 32.0 | — |

1/ Soil Capability classification is derived from the ~~unpublished~~ Rosebud County Soil Survey Report, issued ~~June 1972~~

2/ Cropland, land suitable for cropland and average predicted crop yield derived from the unpublished Rosebud ~~Custer~~ Soil Survey Report, ~~issued June 1972~~ and data from Agricultural Stabilization and Conservation Service, ~~Custer~~ Rosebud County.

b. Indirect Impacts

Physical scientists on the site-specific-analysis team predicted nonlosses in off-site agricultural production due to changes in water quality or quantity. Since there are no estimates of changes in off-site productivity, no significant economic impacts other than those previously shown are expected to occur.

c. Rancher Perspectives On Economic and Social Impacts

Two of the three agricultural landowners in the Colstrip A and B EMU were contacted. The largest landowner has 7% of the land in the EMU. The smallest has 3% of the EMU acreage. One of the landowners felt he would suffer a net economic hardship while one felt he would benefit economically with mining. While one of the operators felt he may benefit economically, he felt he would suffer a lowering of his level of quality of life. One of the ranchers is adamantly opposed to development. One rancher was undecided about his stand on development of coal mining.

2. Recreation

No significant long-term impacts are expected to occur on the tract. Some secondary impacts would occur. Overall recreational demand on federal and private lands would increase due to population increases and the construction or relocation of roads at the mine site might improve legal and/or physical access to some areas. These increases would probably reduce levels of recreation enjoyment due to increased crowding, litter and pollution at and near developed recreation sites.

3. Other Land Uses

Impacts on land use would be relatively minor but highly concentrated. Industrial activities would be introduced into an area of existing activity and with great ability to support additional mining without construction of major facilities or improvement of existing transportation routes. The existing ranching and wildlife uses of the tract would be displaced for the life of the mine, but would again be possible after reclamation. The mine will disturb 3,460 acres plus additional offsite acreages for roads, and utilities. Assuming respective rights-of-way widths of 100, 200, and 60 feet, the additional disturbed area would total 325 acres for relocation of 2 1/4 miles of the county road, and a short powerline route from Colstrip.

b. Indirect Impacts

Physical relocations on the site-specific-analysis open preserved landscapes in off-site agricultural production due to changes in water quality or quantity. Since there are no estimates of changes in off-site productivity, no significant economic impacts other than those previously shown are expected to occur.

c. Landowner Perspectives on Economic and Social Impacts

Two of the three agricultural landowners in the Galactic A and B EIS were contacted. The largest landowner has 7% of the land in the EIS. The smallest has 1% of the EIS acreage. One of the landowners felt he would suffer a net economic hardship while one felt he would benefit economically with mining. While one of the operators felt he may benefit economically, he felt he would suffer a lowering of his level of quality of life. One of the ranchers is adversely opposed to development. One rancher was undecided about his stand on development of coal mining.

3. Mitigation

No significant long-term impacts are expected to occur on the basin; some secondary impacts would occur. Overall recreational demand on federal and private lands would increase due to population increases and the construction or relocation of roads as the mine site might improve legal and/or physical access to more areas. These increases would probably reduce levels of recreation enjoyment due to increased crowding, litter and pollution as well as developed recreation sites.

4. Other Land Uses

Impacts on land use would be relatively minor but highly concentrated. Industrial activities would be introduced into an area of existing activity and with great ability to support additional mining without construction of major facilities or improvement of existing transportation routes. The existing roading and utilities some of the times would be displaced for the life of the mine, but would again be available for reclamation. The mine will disturb 3,460 acres plus additional offsite acreage for roads, and utilities. Assuming respective right-of-way widths of 100, 200, and 50 feet, the additional disturbed area would total 319 acres for relocation of 2 1/4 miles of the county road, and 4 short powerline runs from Galactic.

Changes in the land from these mine-related uses would be mostly temporary and insignificant after reclamation. The existing road system would have to be upgraded with roads to the site. Problems associated with this include increased trespass, vandalism, litter, and fire hazard potentials. Increased road and rail traffic also increases the potential for more accidents because of greater exposure. These impacts would cease at the end of mining if unnecessary transportation corridors are abandoned and reclaimed; however, this type of land use commonly remains longer than the activity it serves.

H. WILDLIFE

The impacts upon wildlife habitats and populations are summarized in the matrix (appendix). Impacts are rated for the projected 20-year life span of the mine.

One sharp-tailed grouse arena along with the surrounding nesting habitat would be lost in mining. Since the area-wide population of sharp-tailed grouse appears to be stable or increasing and similar habitat exists on adjacent areas, impacts on the grouse population would probably be minimal.

Habitat lost to mining would displace up to 16 mule deer and 30 antelope from all or portions of their traditional use areas. Some mule deer winter use available habitat would be lost.

Mining would disturb the hunting territory for the golden eagle nest to the west of the EMU. The extent of the disturbance is not known as the actual territory has not yet been delineated.

Habitat for non-game birds, mammals, reptiles and amphibians would be lost during mining. No estimate of the numbers displaced is known, but it is felt it will be a low impact based on the availability of similar adjacent habitats.

Increased traffic along the East Fork of Armells Creek would increase the number of game and non-game birds and animals killed by vehicular accidents and illegal hunting activity. No estimate of this impact can be made at this time.

I. CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct impact over the life of the mine, from construction of facilities, haul roads, transportation corridors and mining activity, resulting in damage and destruction to sites, artifacts, and their immediate environmental context, and the data these contain. Sites not immediately impacted by the above activities are subject to impacts from increased access, erosion, and vandalism. Cultural resources buried by colluvial or alluvial deposition and not located in surface inventory would also be destroyed.

Should the tract be leased, a mitigation program will be developed for all affected cultural resources. Implementation of avoidance and preservation alternatives is performed; if these are not feasible, a scientific program of data retrieval will be developed and implemented.

J. VISUAL RESOURCE MANAGEMENT

Mining would completely change the character of the tract. Visual impacts would increase in the form of land disturbances due to the mines, roads, and utilities. Changes to the topography, vegetation and scenic quality would occur. There are existing industrial influences in the area, so there would be little change. Along with this, some additional decrease in visibility would occur from dust and vehicle emissions. Overall, adverse impacts would be relatively insignificant during mining because of existing area mines. Scenic quality is not expected to be significantly altered after reclamation. Due to the location, these visual impacts would be experienced by persons traveling on State Highway 315. Generally, the visual impacts would be about the same as those of other mines in the vicinity and would be cumulative with those mines. All of the impacts would either cease or be reduced to very low levels when mining ends and reclamation is completed.

K. ECONOMICS

1. Employment Change

If Western Energy Co. obtains the lease, no significant economic impacts would occur from leasing of uncommitted federal coal resources in Colstrip Area A and B other than continuing mine life and the same level of mine employment that exists.

L. SOCIOLOGY

1. Population

Because there will be no additional employment and population immigration, there will be no impacts from mining in Colstrip Area A and B over and above what is already occurring with construction of Colstrip 3 and 4 power units.

2. Attitudes

The impacts of development on social attitudes cannot be assessed until after development has occurred. There is no way to estimate what changes, if any, in attitudes would occur.

M. NOISE

The present noises would slightly increase from industrial origins as heavy mining equipment, road traffic and explosives use are increased from present levels.

N. CLIMATE AND AIR QUALITY

Continuation of surface mining of A and B would result in loading basically the same levels of fugitive dust to the air as is being experienced in these areas during current mining. The air quality of the study area is generally excellent, except for local fugitive dust and gaseous emissions. Particulate air quality standards in this area have been violated, and approximately a 120-square mile area in the Colstrip area has been classified as a nonattainment zone for total suspended particulates (TSP). Under law, nonattainment areas may not create new sources of particulates and measures must be taken to control present dust-emitting sources. The Northern Cheyenne Indian Reservation is approximately six miles south of the proposed leasing area. This Reservation has a Class I air quality designation, which will have a very large influence on the coal leasing proposal.

IV. SHORT-TERM VERSUS LONG-TERM IMPACTS

A. SHORT TERM

Production through life of mine is estimated at 146 million tons of coal. Most of the resource would be exported, however, some may be used on-site for power generation. The tract would be temporarily committed to a single use that would in turn impact other potential uses.

Short-term impacts of mining all Colstrip Tracts for wildlife would be the loss of four sharp-tailed grouse arenas and the surrounding nesting habitat. Up to 34 mule deer and 50 antelope would be displaced during mining. One pair of nesting falcons and one pair of nesting golden eagles would be disturbed during the life of the mines. Habitat for non-game birds, mammals and reptiles would also be lost in the short term.

Vegetative production studies conducted at Colstrip during the short term period have proven successful by using introduced species. The short term effect using native species (51% or more required by State regulation) mixed with introduced species is not known at this time.

B. LONG TERM

Evidence of mining and reclamation would remain in the form of less contrasting topography.

Long-term impacts on wildlife would be dependent on the success of reclaimation. If shrubs and ponderosa pine cover cannot be restored, the vegetative diversity of the area would be decreased along with an attendant decrease in the variety of birds and animals that use the existent vegetative types.

The most serious effect on vegetation would be the long-term loss of the natural vegetation mosaic and species diversity. The long term productivity on reclaimed sites at Colstrip are not known at this time.

V. NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM-Washington Office Information Memo 79-282, August, 1979. Approximately 38 British thermal units (BTUs) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 8,462 BTUs. The ration of energy produced to that expended is over 225 BTUs/1 BTU.

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The net energy relationship (ratio of energy produced to energy consumed) for the Colstrip "A" and "B" EMU is 348 to 1.[1]

[1] Based on the Btu value per pound of coal as given in the tract delineation reports and on an average input energy value of 25.6 Btu's of energy consumed for each pound of coal produced (average of the energy consumption of the Decker mines as described by USGS in a 1977 EIS and the WECO area B expansion as described by the Montana Department of State Lands in a 1978 EIS). Only direct energy consumption was considered (the ratios shown do not contain any estimate of energy used in transporting the coal from the mine to the demand center).

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Soils | There are 36 soil series in the tract mapped at level two in a survey done by the Soil Conservation Service which are found along narrow ridges, gently sloping hillsides and wide, shallow valleys. | There will be displacement of soil by water and wind erosional forces; change in soil structure and natural fertility and significant problems in revegetation and stabilization on steeper slopes. | Significance of the impact will be high. Reconstruction potential is rated as 76% poor and suitability of soil material for reclamability is rated as 52% poor and 11% unsuitable | Data reliability is 80% from the Rosebud County Soil Series Descriptions and interpretations.<br><br>Better soils in the bottomlands are more accurately mapped than those on the rangelands and steep-sided slopes. | |
| Water Resources<br>Ground Water<br>Use in Tract | 5 stock wells are in use in the non-leased part of the Tract. | All wells would need to be redrilled if needed after mining. | Minimal cost to redrill wells for mining company. | Good | |
| Quantity | About 300 acres of the coal bed is dry in the Tract, and it is only partially saturated in another area. The natural ground water flow is estimated at 525 cu ft/day and is toward E.Fk.Armells Cr. | Water would flow into the mine pit at the given rate. About 12 wells would be affected outside the Tract during mining. | Medium anticipated flow rates of Colstrip tracts. Some draw down on company wells. | Good | |
| Quality | Medium TDS cone is 880 mg/L and ranges from 455 to 2,200 mg/L. | Some increases in salinity of wells in and above Rosebud coal seam after mining. Water would still be usable for stock. | Significant and long term. | Good | More research is needed to predict quantitative changes in post-mining quality. |

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Surface Water Quantity | E. Fork Armells Creek flows through the Tract. It flows except during extreme periods. Mean annual flow is estimated at 2,200 ac ft. Only 200 acres of the entire Armells Creek drainage is irrigated. | Only slight reduction of flow during mining with adequate stream buffers and diversions Possible slight effect after mining. | Minor | Good | |
| Quality | Mean TDS is about 2,900 mg/L. High irrigation salinity exists except during high flows. Sediment yield is estimated at 0.5 ac ft/sq mi/yr. | Low flow salinity would increase slightly after mining. Water would still be usable for stock and high flow water spreaders. Sediment yields would be proportional to soil erosion losses. | Slight | Fair-Good | |
| Alluvial Valley Floors and Flood Plains | Through the Tract is a flood plain and an AVF which has been leased. | Mining of E. Fork Armells Cr. could disrupt the flow during mining and the channel after mining. | Unknown | Fair-Good | State and federal regulations require restoration of channels. Channel stability depends on techniques used. |
| Agriculture | There are no acres of Class II, III and IV land in the Tract that are presently being cropped. | None | None | Data reliability is 80% from the Rosebud County. | |

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Vegetation<br>Rangeland types | EMU Acres | Acres being Disturbed | | | |
| Ponderosa Pine savannah | Grassland 3560<br>Sagebrush-grassland 1210<br>Ponderosa pine 1420<br>Other land 1580<br>7770 | Grassland 2470 High<br>Sagebrush-grassland 620 High<br>Ponderosa pine 1274 High<br>Other land 110 Low<br>4474 | High - - - -<br>Long-term elimination of the natural vegetation mosaic and species diversity. | Good | Reclamation of Ponderosa pine not yet proven. |
| Animal Unit Month (SVIM) | 1011 AUMs | High | Loss of 1011 AUMs-High | Good | |
| Animal Unit Month If Range is in excellent condition 100-76% | | | | Good | 100% 76%<br>1605 AUMs - 1182 AUMs |
| Threatened, Endangered or Noxious Species | There are no threatened or endnagered plant species found growing in the EMU. However, there are six noxious species found growing in the Powder River Resource Area, but it has not been determined if these species are found growing in the EMU. The species are:<br>A. Conuolulus arvensis<br>B. Cirsium arvense<br>C. Euphorbia esula<br>D. Centaurea repens<br>E. Cardaria draba<br>F. Centaurea maculosa | Low | Low | Good<br>May 16, 1980<br>Regional Director<br>Region 6 U.S. FWS<br>Denver, Colorado | |

COLSTRIP A AND B

| ELEMENT | PRESENT SITUATION | | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|---|---|
| Reclamation-Vegetation | On Federal, State and Private lands, the Office of Surface Mining (OSM) assures that the mining company establishes a diverse effective and permanent vegetative cover to standards set by the Department of State lands of Montana and the Federal Bureau of Land Management. | | Low | | High - failure of Reclamation<br><br>Low - success of Reclamation | <br><br>Good | |
| Wildlife Habitat | Acres* | % of Total | Acres Disturbed** | Year 2026 | | | |
| Grassland | 3560 | 46 | 2470 | Low negative | Low negative | Good | |
| Sagebrush-grassland | 1210 | 16 | 620 | Moderate negative | Low negative | Good | |
| Ponderosa pine | 1420 | 18 | 1274 | High negative | High negative | Good | Reclamation of ponderosa pine not yet proven. |
| Hardwood bottoms | 110 | 1 | 0 | | | | |
| Agricultural | 1470 | 19 | 110 | Low negative | Low negative | Good | |
| Populations | Level of Use | | | | | | |
| Mule deer | Average | | Low negative | | Low negative | Good | Reclamation will minimize impacts. |
| Antelope | Average | | Low negative | | Low negative | Good | |
| Sharp-tailed grouse | Average | | Low negative | | Low negative | Good | |
| Pheasant | Low | | No change | | No change | Good | |
| Golden eagle | Low | | No change | | No change | Good | |
| Other Raptors | Average | | Low negative | | Low negative | Good | |
| Non-game birds & mammals | Average | | Low negative | | Low negative | Good | |
| State species of special interest or concern | Low | | Low negative | | Low negative | Good | |
| Threatened or Endangered | None occur | | ----- | | ----- | | |
| | *Based on estimate current mining programs | | **Based on estimate of mining sequence | | | | |

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Cultural/Historical Values | 97% of tract acreage. 100% of surface over federal coal inventoried. 14 prehistoric sites, two historic sites, one recent site, one historic to recent site, 48 isolated finds recorded. One site determined eligible for the National Register. Mitigation partially complete.<br><br>Projected site density at 2.88 ± 24 sites per 40 acres. 10% probability of locating additional National Register eligible sites. | Direct impact to all cultural resources within tract boundaries. | Damage and destruction of sites, artifacts, environmental context, and data these contain. Reduction of present finite, non-renewable resource base. Mitigation through data retrieval, while providing a short-term gain of information on prehistory and history, represents an irreversible commitment of the resource. | Good. Surveyed acreage has been resurveyed to correct incomplete recording in surveys conducted in 1971, 1973 and 1976. | |

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Recreation | No development or known use of the area. Very limited use may occur. Hunting by permission of landowner. No public access exists. | None. No recreation functions are planned for the area and legal access does not exist. | Virtually none on the short term. No effect on a long term basis. | Poor. | Recreation data is virtually non-existent. |
| Wilderness | No wilderness potential within or near area. | None. | None. | Excellent. | Wilderness inventory complete and area eliminated from consideration. |
| VRM | Strip-mining occurring nearby. Scenic quality fairly low and dominated by existing mines. Scenic quality class C. | Disturbance of landforms and natural scene. Impacts cumulative with area mines. Some activities visible from State Highway 315. | Moderate during mine life. Low after reclamation. | High. | Very difficult to mitigate impacts while mining is occurring. |
| Noise<br>Air Quality | Noises and odors from artificial origins due to mining activities now occurring in area. | Noises and odors would increse slightly from present levels of industrial influence. | Quite severe during mining. Impact would cease when mine is closed. | Excellent. | Impossible to mitigate during mine life. |

| ELEMENT | PRESENT SITUATION | ANTICIPATED EFFECT OF LEASING/DEVELOPMENT | SIGNIFICANCE OF ANTICIPATED IMPACT | DATA RELIABILITY | COMMENTS |
|---|---|---|---|---|---|
| Transportation: | | | | | |
| Employee | Roads to area adequate. Site access by gravel road. | Increased traffic on State Highway 315. Potential for more accidents. | Moderate on all accounts during mining. Very low after mines close. | Good. | Road improvements should contribute to safety after mining traffic ceases. |
| Product | Roads adequate for transport. Rail service exists to operating mines and only a short spur is needed to connect with line. | Increased traffic hazards. Increased surface disturbance. | Moderate. Low. | Good for all items. | |
| Land Use | Tract used for ranching. Strip-mining occurs nearby. | Expansion of industrial activities. Land removed from existing uses. | Moderate during mining. Low to none after reclamation. | Good. | |

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